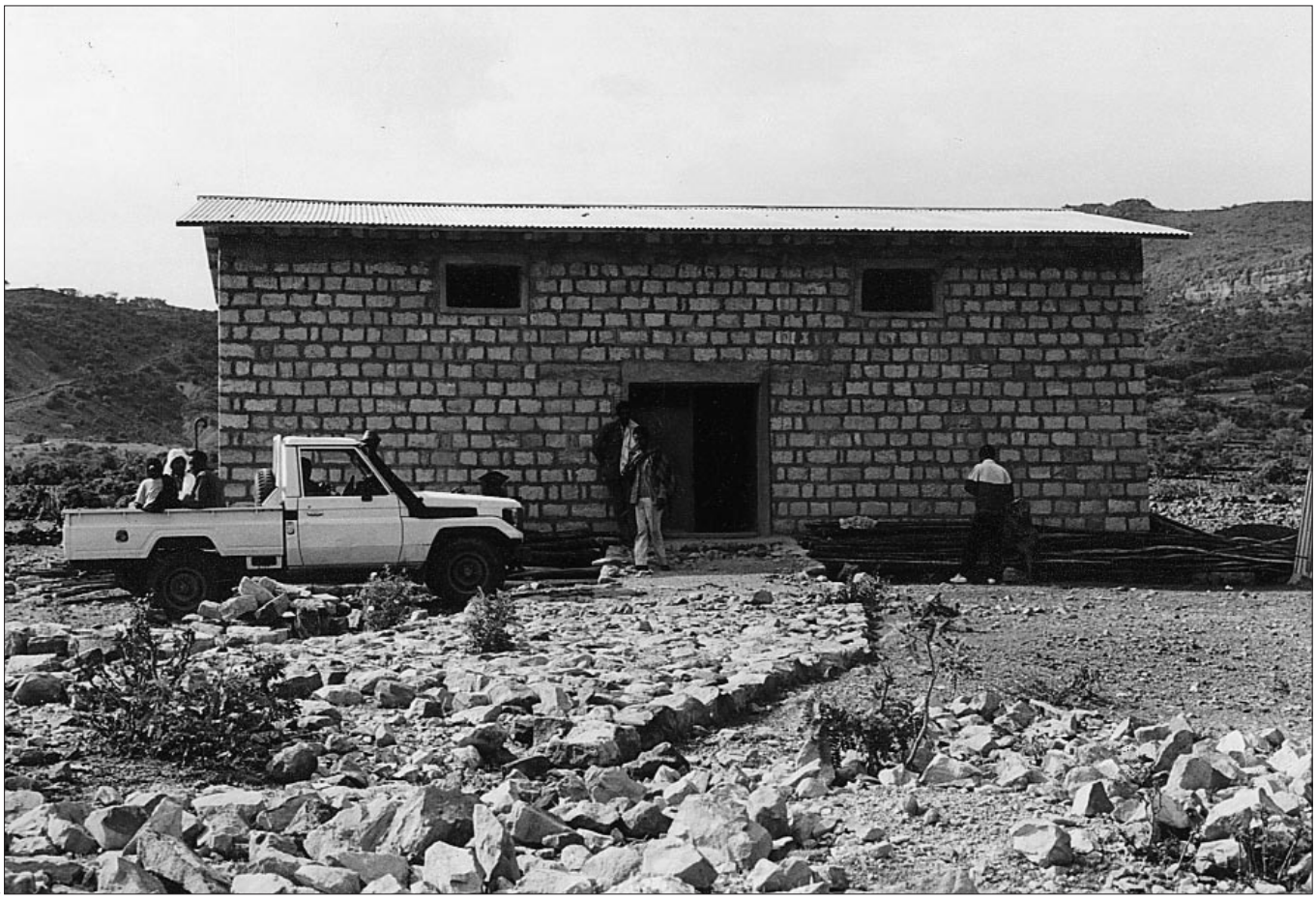

photo: Kostiaan Teekens

*Community Seedbank in Hahaile, Ethiopia*

# *In situ* conservation: the Ethiopian experience

**Abebe Demissie**

Plant species of economic importance are not randomly distributed throughout the world. N. I. Vavilov was among the first scientists to conceptualise this phenomenon and identified eight such centres of diversity. Because it has a wide range of ecogeographic, edaphic and climatic conditions, Ethiopia has considerable plant genetic diversity. It is a major world centre of genetic diversity for many regionally and globally important domesticated plant species including wheat, barley, sorghum, teff, chickpeas, coffee, as well as other less-appreciated but potentially useful crops.

The permanent interaction of cultivated crops with their wild relatives under diverse ecosystems, coupled with farmers' practices and socioeconomic factors, have contributed to making Ethiopia one of the richest areas of genetically diverse farmers' varieties in the world. Even crops that were originally domesticated elsewhere exhibit immense variation in various adaptive traits.

## Farmers' varieties important

The critical importance of plant genetic resources as a component of natural resources management has been recognised for some time. Plant genetic resources form the basis for food security and sustainable agricultural development. A growing global population needs crop plants with improved tolerance to several stress factors and able to meet the growing need for food, fibre, and clothing. This means that plant breeders must have continuous and dependable access to plant genetic reservoirs. Farmers' varieties, their immediate relatives and related wild species are particularly important sources of new genes for breeding programmes.

Farmers' varieties are uniquely adapted, genetically diverse cultivars. They are repositories of traits that have evolved in local environments over long periods of time as a result of farmers' cultivation and selection. As sources of adapted genes, farmers' varieties have been the raw material from which modern and often higher yielding crop varieties have been developed. The conservation of local landraces is, therefore, of critical importance both for scientific crop improvement and subsistence agriculture.

## *Ex situ* conservation

Two conservation strategies are generally distinguished: *in situ* and *ex situ* (see Box 1, p29). At the global level, genetic erosion has been addressed by efforts to conserve plant genetic resources in off-farm or *ex situ* gene banks, both as seeds and as living plants. To date, nearly all such efforts have focused on conserving crop genetic resources in formal gene banks that are part of an international institutional network. *Ex situ* conservation has limits. Gene banks are limited in what they can store. They have collected only a fraction of the existing genetic diversity and the size of the sample varies and depends on the crop. For instance, relatively large collections exist of the major food crops. Large holdings of rice, wheat, barley, maize, potato and other crops are kept in CGIAR international research centres. In contrast, minor food crops have hardly been collected for *ex situ* conservation even though the genetic diversity in these crops is more threatened with replacement by the principal crops. The disassociation of the material kept in genebanks from their users' communities limits access to the materials by the primary users and original custodian of the materi-

al, the farmers. It also terminates the enhancement of the material through the process of natural evolution.

### *In situ* conservation

The primary objective of *in situ* conservation is to conserve the biodiversity of traditional crop varieties on the farm with the help of farmers' knowledge and traditional practices. *In situ* or on-farm conservation of agrobiodiversity is conservation in a dynamic agroecosystem, ideally one which is self-supporting and favouring evolutionary processes. Thus, it allows ongoing host-parasite co-evolution, which is likely to provide material resistant to diseases and pests. This contrasts with the efforts to conserve crop diversity in static off-farm gene banks. However, *in situ* maintained diversity is more difficult to access for breeders who like to use specific materials for their breeding programmes.

### Community-based conservation

The objective of the Ethiopian on-farm initiative is to establish a programme linking *ex situ* and *in situ* conservation. *In situ* and *ex situ* conservation are seen as complementary in a way that maximises the retention and continued evolution of the genetic qualities of farmers' varieties. It also aims to avoid the loss of variation during rejuvenation and maintenance in formal gene banks. This means that farmers' *in situ* conservation must be part of the existing cropping system since this is the only way to maintain the complex interaction of genetically diverse traditional cultivated varieties with their associated pests, predators and pathogens. In this setup, both natural and human selection operate in the traditional way.

As part of the *in situ* conservation effort in Ethiopia, Community Seed Banks (CSBs) are being established as pilot projects in 6 different agroecological zones. Like the formal gene banks, conservation of locally adapted traditional varieties in community-managed seed banks will ensure the sustained provision of useful variability to the community and to various breeding programmes complementing the formal network of international gene banks.

The CSBs serve as a springboard for increased extension contact and local participation in the conservation of farmers' varieties. They can be used to organise local support for conservation, train farmers in conservation activities, build low cost and low maintenance storage facilities, and link farmers, extension agents and gene bank staff. In forming CSBs, the first step was to contact local leaders and farmers in selected districts and communities, and organise a local association, the Crop Conservation Association (CCA). The CCA is the principal contact point between the Community Seed Bank, extension agents and the gene bank. The CCA, the district extension agents, and the gene bank join in building the actual Community Seed Bank facility with funds made available by the project.

The next step in establishing a community based conservation programme was to select a local farmer conservator. This was done using criteria developed by the community and gene bank and took place during a meeting/workshop involving the CCA, community leaders, extension agents and local farmers. The farmer conservator belongs to the group of farmers who plant, select and store seeds from local materials. The farmer conservator is the primary local contact and is responsible for managing the CSB. In collaboration with extension agents the farmer conservator and other farmers are trained by gene bank staff in selecting, documenting and storing genetic resources in the CSB.

Community storage is already practised in Ethiopia to ensure seed in times of stress and the CSB builds on this age-old tradition. Farmers store part of their seed in the CSB and this seed is available for retrieval at any time. A small, but representative seed sample is taken for storage at the Community Gene Bank and a duplicate sample is kept in the national gene bank at the Institute for Biodiversity Conservation and Research.

### Operational strategy

Initially, subsidies were provided on the basis of the yield differentials of advanced and farmers' varieties. In the long run, continuing *in situ* conservation cannot rely on direct production subsidies to farmers. In order to work towards a sustainable compensation scheme after project funding is over, a reward system needs to be put in place.

The production and utilisation of farmers' varieties is important for Ethiopian farming communities. In this context it would be important to identify where agricultural production and pricing policies are likely to have a negative effect on the continuing use of traditional varieties/landraces. At the end of the day, farmers themselves must feel there are advantages to continuing with traditional crops if they are to sustain their participation in the conservation of farmers' varieties.

### Support

Another broad strategy that supports a farmer-based conservation programme is the generation of non-market and market incentives for growing farmers' varieties. Critical here is identifying the specific factors that enhance or limit the continued utilisation of farmers' varieties by farming communities. A key component is to identify special consumer products that make use of farmers' varieties on the local, national and international market. There is much potential, for example, in urban markets in industrially developed countries for organically produced products. Increasing interest in organic products may provide opportunities for the production of farmers' varieties with special high nutrient or culinary quality even though yields may be low.

Major non-market incentives to the farmers involved with the Community Gene Bank will be the increased training and enhanced extension packages received by the farmer conservator and associated farmers. Extension agents and the farmer conservator will not only be available to select and store local seed, but will also work with farmers in improving crop production. A flexible strategy to accommodate both improved crop production techniques and the conservation of local crop varieties is anticipated. Both the extension agents and the farmer conservator will be able to advise farmers on the advantages of different crop varieties and where these might do well. They will be able to help farmers increase production by improved crop management techniques such as soil erosion measures and pest control. They can also be of help in enhancing the material by incorporating desirable genes. Educational material that explains the importance of Ethiopian crop resources should also be developed.

The sustainability of a farm-based conservation of farmers' varieties may ultimately depend on the availability of local and external markets. The local market is unlikely to be large enough to absorb production and it is not sensitive to this type of product at present. The project will seek to identify products that are based on farmers varieties and which can be marketed as value-added products to support their cultivation. Other market niches for farmers' varieties probably exist and warrant special initiatives.

In spite of the low yields obtained, it is obvious from the experience gained so far that local farming communities want to continue cultivating farmers' varieties. This is because of their stable yield and the quality of traditional varieties. The communities clearly appreciated the project. However, it is unrealistic to expect it to be fully sustainable after just four years. This type of project will need international assistance for a long time if it is to make a lasting impact. Meanwhile, the international community should develop an awareness of the value of farmers' varieties for future food security and be ready to promote *in situ* conservation programmes.

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